

**WHAT IS CLAIMED IS:**

- 1 1. A method for managing extended attribute data, said  
2 method comprising:  
3 identifying a data area in a data space to store  
4 attribute data;  
5 storing the attribute data in the identified data  
6 area; and  
7 marking one or more bits in a bitmap corresponding to  
8 the data space, wherein the marked bits  
9 correspond to the identified data area.
- 1 2. The method as described in claim 1 further comprising:  
2 storing an extended attribute type, a size, and an  
3 offset in an extended attribute directory.
- 1 3. The method as described in claim 1 wherein the data  
2 space includes an inline page and one or more outline  
3 pages.
- 1 4. The method as described in claim 3 wherein the inline  
2 page and the outline pages each have a corresponding  
3 bitmap.
- 1 5. The method as described in claim 1 further comprising:  
2 receiving an extended attribute type and the attribute  
3 data;  
4 calculating a number of lines needed to store the  
5 attribute data in the data space, wherein the  
6 data space includes an inline space and one or  
7 more outline spaces;

8 analyzing a bitmap corresponding with the inline space  
9 to determine whether the calculated number of  
10 lines are available in the inline space to store  
11 the attribute data; and  
12 storing the attribute data in one or more lines  
13 included in the inline space in response to the  
14 analysis determining that the number of lines are  
15 available.

1 6. The method as described in claim 5, wherein the data  
2 space includes one or more outline data spaces, the  
3 method further comprising:  
4 analyzing one or more outline bitmaps, each of the  
5 outline bitmaps corresponding with one of the  
6 outline data spaces, to determine whether the  
7 calculated number of lines are available in any  
8 of the outline spaces to store the attribute  
9 data; and  
10 storing the attribute data in one or more lines  
11 included in at least one of the outline spaces in  
12 response to the analysis of outline bitmaps  
13 determining that the number of lines are  
14 available in at least one outline data space.

1 7. The method as described in claim 1 further comprising:  
2 receiving a retrieval request from a requestor for an  
3 attribute stored in the data space;  
4 identifying an offset and a length in an extended  
5 attribute directory corresponding to the  
6 requested attribute;  
7 calculating a number of lines based on the identified  
8 length;

9       retrieving the calculated number of lines from the  
10       data space beginning at the offset; and  
11       providing the calculated number of lines to the  
12       requestor.

1   8.   The method as described in claim 7 further comprising:  
2       calculating a last line length corresponding to a last  
3       line retrieved based on the length; and  
4       truncating the last line based on the last line length  
5       prior to the providing.

1   9.   The method as described in claim 1 further comprising:  
2       receiving a deletion request for an attribute stored  
3       in the data space;  
4       locating an attribute offset and an attribute length  
5       in an attribute directory corresponding to the  
6       deletion request;  
7       calculating a number of lines based on the attribute  
8       length;  
9       identifying a stored data area based on the attribute  
10       offset and the calculated number of lines;  
11       resetting one or more bits corresponding to the  
12       identified stored data area in the bitmap,  
13       wherein the resetting indicates that the  
14       corresponding data area is available for storing  
15       of a new attribute.

1   10.   The method as described in claim 1 further comprising:  
2       receiving a modification request for an attribute  
3       stored in the data space, the request including a  
4       modified attribute data;

5        locating an attribute offset and an attribute length  
6            in an attribute directory corresponding to the  
7            modification request;  
8        calculating a stored number of lines based on the  
9            attribute length and a needed number of lines  
10          based on the modified attribute data;  
11        identifying a current storage location within the data  
12          space based on the attribute offset and stored  
13          number of lines;  
14        comparing the stored number of lines with the needed  
15          number of lines, in response to the comparing:  
16        replacing the stored attribute data with the  
17            modified attribute data in the identified  
18            current storage location in response to the  
19            stored number of lines equaling the needed  
20            number of lines;  
21        resetting one or more bits corresponding to the  
22            identified current storage location in the  
23            bitmap, wherein the resetting indicates that  
24            the corresponding data area is available for  
25            storing of a new attribute, in response to  
26            the stored number of lines being greater  
27            than the needed number of lines;  
28        relocating the modified attribute data to a  
29            different data area response to the stored  
30            number of lines being less than the needed  
31            number of lines and determining that there  
32            is an insufficient number of unused lines  
33            following the current storage location to  
34            store the modified attribute data; and  
35        appending the modified attribute data to one or  
36          more lines following the current storage

location in response to the stored number of lines being less than the needed number of lines and determining that there are a sufficient number of unused lines following the current storage location to store the modified attribute data.

11. An information handling system comprising:
- one or more processors;
  - a memory accessible by the processors;
  - one or more nonvolatile storage devices accessible by the processors, the nonvolatile storage devices including one or more files and one or more extended attributes associated with the files;
  - and
  - an extended attribute management tool to manage the extended attributes, the extended attribute tool including:
    - means for identifying a data area in a data space within the nonvolatile storage devices to store attribute data;
    - means for storing the attribute data in the identified data area; and
    - means for marking one or more bits in a bitmap corresponding to the data space, wherein the marked bits correspond to the identified data area.

12. The information handling system as described in claim 11 further comprising:
- means for storing an extended attribute type, a size, and an offset in an extended attribute directory.

- 1 13. The information handling system as described in claim  
2 11 wherein the data space includes an inline page and  
3 one or more outline pages.
- 1 14. The information handling system as described in claim  
2 13 wherein the inline page and the outline pages each  
3 have a corresponding bitmap.
- 1 15. The information handling system as described in claim  
2 11 further comprising:  
3 means for receiving an extended attribute type and the  
4 attribute data;  
5 means for calculating a number of lines needed to  
6 store the attribute data in the data space,  
7 wherein the data space includes an inline space  
8 and one or more outline spaces;  
9 means for analyzing a bitmap corresponding with the  
10 inline space to determine whether the calculated  
11 number of lines are available in the inline space  
12 to store the attribute data; and  
13 means for storing the attribute data in one or more  
14 lines included in the inline space in response to  
15 the analysis determining that the number of lines  
16 are available.
- 1 16. The information handling system as described in claim  
2 15, wherein the data space includes one or more  
3 outline data spaces, the information handling system  
4 further comprising:  
5 means for analyzing one or more outline bitmaps, each  
6 of the outline bitmaps corresponding with one of  
7 the outline data spaces, to determine whether the

8           calculated number of lines are available in any  
9           of the outline spaces to store the attribute  
10          data; and  
11       means for storing the attribute data in one or more  
12          lines included in at least one of the outline  
13          spaces in response to the analysis of outline  
14          bitmaps determining that the number of lines are  
15          available in at least one outline data space.

1   17.   The information handling system as described in claim  
2       11 further comprising:

3       means for receiving a retrieval request from a  
4           requestor for an attribute stored in the data  
5           space;

6       means for identifying an offset and a length in an  
7           extended attribute directory corresponding to the  
8           requested attribute;

9       means for calculating a number of lines based on the  
10          identified length;

11       means for retrieving the calculated number of lines  
12          from the data space beginning at the offset; and

13       means for providing the calculated number of lines to  
14          the requestor.

1   18.   The information handling system as described in claim  
2       17 further comprising:

3       means for calculating a last line length corresponding  
4           to a last line retrieved based on the length; and  
5       means for truncating the last line based on the last  
6          line length prior to the providing.

1   19.   The information handling system as described in claim  
2       11 further comprising:

3 means for receiving a deletion request for an  
4 attribute stored in the data space;  
5 means for locating an attribute offset and an  
6 attribute length in an attribute directory  
7 corresponding to the deletion request;  
8 means for calculating a number of lines based on the  
9 attribute length;  
10 means for identifying a stored data area based on the  
11 attribute offset and the calculated number of  
12 lines;  
13 means for resetting one or more bits corresponding to  
14 the identified stored data area in the bitmap,  
15 wherein the resetting indicates that the  
16 corresponding data area is available for storing  
17 of a new attribute.

1 20. The information handling system as described in claim  
2 11 further comprising:

3 means for receiving a modification request for an  
4 attribute stored in the data space, the request  
5 including a modified attribute data;  
6 means for locating an attribute offset and an  
7 attribute length in an attribute directory  
8 corresponding to the modification request;  
9 means for calculating a stored number of lines based  
10 on the attribute length and a needed number of  
11 lines based on the modified attribute data;  
12 means for identifying a current storage location  
13 within the data space based on the attribute  
14 offset and stored number of lines;  
15 means for comparing the stored number of lines with  
16 the needed number of lines

17 in response to the comparing:

18 means for replacing the stored attribute data  
19 with the modified attribute data in the  
20 identified current storage location in  
21 response to the stored number of lines  
22 equaling the needed number of lines;

23 means for resetting one or more bits  
24 corresponding to the identified current  
25 storage location in the bitmap, wherein the  
26 resetting includes means for indicating that  
27 the corresponding data area is available for  
28 storing of a new attribute, in response to  
29 the stored number of lines being greater  
30 than the needed number of lines;

31 means for relocating the modified attribute data  
32 to a different data area response to the  
33 stored number of lines being less than the  
34 needed number of lines and determining that  
35 there is an insufficient number of unused  
36 lines following the current storage location  
37 to store the modified attribute data; and

38 means for appending the modified attribute data  
39 to one or more lines following the current  
40 storage location in response to the stored  
41 number of lines being less than the needed  
42 number of lines and determining that there  
43 are a sufficient number of unused lines  
44 following the current storage location to  
45 store the modified attribute data.

1 21. A computer program product for managing extended  
2 attribute data, said computer program product  
3 comprising:  
4 means for identifying a data area in a data space to  
5 store attribute data;  
6 means for storing the attribute data in the identified  
7 data area; and  
8 means for marking one or more bits in a bitmap  
9 corresponding to the data space, wherein the  
10 marked bits correspond to the identified data  
11 area.

1 22. The computer program product as described in claim 21  
2 further comprising:  
3 means for storing an extended attribute type, a size,  
4 and an offset in an extended attribute directory.

1 23. The computer program product as described in claim 21  
2 wherein the data space includes an inline page and one  
3 or more outline pages.

1 24. The computer program product as described in claim 23  
2 wherein the inline page and the outline pages each  
3 have a corresponding bitmap.

1 25. The computer program product as described in claim 21  
2 further comprising:  
3 means for receiving an extended attribute type and the  
4 attribute data;  
5 means for calculating a number of lines needed to  
6 store the attribute data in the data space,  
7 wherein the data space includes an inline space  
8 and one or more outline spaces;

9 means for analyzing a bitmap corresponding with the  
10 inline space to determine whether the calculated  
11 number of lines are available in the inline space  
12 to store the attribute data; and  
13 means for storing the attribute data in one or more  
14 lines included in the inline space in response to  
15 the analysis determining that the number of lines  
16 are available.

1 26. The computer program product as described in claim 25,  
2 wherein the data space includes one or more outline  
3 data spaces, the computer program product further  
4 comprising:

5 means for analyzing one or more outline bitmaps, each  
6 of the outline bitmaps corresponding with one of  
7 the outline data spaces, to determine whether the  
8 calculated number of lines are available in any  
9 of the outline spaces to store the attribute  
10 data; and

11 means for storing the attribute data in one or more  
12 lines included in at least one of the outline  
13 spaces in response to the analysis of outline  
14 bitmaps determining that the number of lines are  
15 available in at least one outline data space.

1 27. The computer program product as described in claim 21  
2 further comprising:

3 means for receiving a retrieval request from a  
4 requestor for an attribute stored in the data  
5 space;

6 means for identifying an offset and a length in an  
7 extended attribute directory corresponding to the  
8 requested attribute;  
9 means for calculating a number of lines based on the  
10 identified length;  
11 means for retrieving the calculated number of lines  
12 from the data space beginning at the offset; and  
13 means for providing the calculated number of lines to  
14 the requestor.

1 28. The computer program product as described in claim 27  
2 further comprising:  
3 means for calculating a last line length corresponding  
4 to a last line retrieved based on the length; and  
5 means for truncating the last line based on the last  
6 line length prior to the providing.

1 29. The computer program product as described in claim 21  
2 further comprising:  
3 means for receiving a deletion request for an  
4 attribute stored in the data space;  
5 means for locating an attribute offset and an  
6 attribute length in an attribute directory  
7 corresponding to the deletion request;  
8 means for calculating a number of lines based on the  
9 attribute length;  
10 means for identifying a stored data area based on the  
11 attribute offset and the calculated number of  
12 lines;  
13 means for resetting one or more bits corresponding to  
14 the identified stored data area in the bitmap,  
15 wherein the resetting indicates that the

16 corresponding data area is available for storing  
17 of a new attribute.

1 30. The computer program product as described in claim 21  
2 further comprising:

3 means for receiving a modification request for an  
4 attribute stored in the data space, the request  
5 including a modified attribute data;

6 means for locating an attribute offset and an  
7 attribute length in an attribute directory  
8 corresponding to the modification request;

9 means for calculating a stored number of lines based  
10 on the attribute length and a needed number of  
11 lines based on the modified attribute data;

12 means for identifying a current storage location  
13 within the data space based on the attribute  
14 offset and stored number of lines;

15 means for comparing the stored number of lines with  
16 the needed number of lines;

17 in response to the comparing:

18 means for replacing the stored attribute data  
19 with the modified attribute data in the  
20 identified current storage location in  
21 response to the stored number of lines  
22 equaling the needed number of lines;

23 means for resetting one or more bits  
24 corresponding to the identified current  
25 storage location in the bitmap, wherein the  
26 resetting indicates that the corresponding  
27 data area is available for storing of a new  
28 attribute, in response to the stored number

29 of lines being greater than the needed  
30 number of lines;  
31 means for relocating the modified attribute data  
32 to a different data area response to the  
33 stored number of lines being less than the  
34 needed number of lines and determining that  
35 there is an insufficient number of unused  
36 lines following the current storage location  
37 to store the modified attribute data; and  
38 means for appending the modified attribute data  
39 to one or more lines following the current  
40 storage location in response to the stored  
41 number of lines being less than the needed  
42 number of lines and determining that there  
43 are a sufficient number of unused lines  
44 following the current storage location to  
45 store the modified attribute data.

1 31. A method for managing extended attribute data, said  
2 method comprising:  
3 identifying a data area in a data space to store  
4 attribute data, the data space including an  
5 inline page and one or more outline pages;  
6 calculating a number of lines needed to store the  
7 attribute data in the data space;  
8 analyzing an inline bitmap corresponding with the  
9 inline page and one or more outline bitmaps  
10 corresponding to the outline pages;  
11 determining a storage location based on the analysis;  
12 storing the attribute data in the determined storage  
13 location;

14 marking one or more bits in the inline bitmap in  
15 response to the storage location being included  
16 in the inline page;  
17 marking one or more bits in one of the outline bitmaps  
18 in response to the storage location being in one  
19 of the outline pages; and  
20 registering an extended attribute type, a size, and an  
21 offset in an extended attribute directory.

1 32. The method as described in claim 31 further  
2 comprising:  
3 receiving a retrieval request from a requestor for an  
4 attribute stored in the data space;  
5 identifying a retrieval offset and a retrieval length  
6 in the extended attribute directory corresponding  
7 to the requested attribute;  
8 calculating a number of lines based on the identified  
9 retrieval length;  
10 retrieving the calculated number of lines from the  
11 data space beginning at the offset; and  
12 providing the calculated number of lines to the  
13 requestor.

1 33. The method as described in claim 32 further  
2 comprising:  
3 calculating a last line length corresponding to a last  
4 line retrieved based on the identified retrieval  
5 length; and  
6 truncating the last line based on the last line length  
7 prior to the providing.

1 34. The method as described in claim 31 further  
2 comprising:

3 receiving a deletion request for an attribute stored  
4 in the data space;  
5 locating an attribute offset and an attribute length  
6 in the extended attribute directory, the  
7 attribute offset and length corresponding to the  
8 deletion request;  
9 calculating a number of lines based on the attribute  
10 length;  
11 identifying a storage area based on the attribute  
12 offset and the calculated number of lines;  
13 resetting one or more bits corresponding to the  
14 identified storage area in the inline bitmap in  
15 response to the storage area identified as being  
16 located in the inline page, wherein the resetting  
17 indicates that the corresponding data area is  
18 available for storing of a new attribute; and  
19 resetting one or more bits corresponding to the  
20 identified storage area in one of the outline  
21 bitmaps in response to the storage area  
22 identified as being located one of the outline  
23 pages, wherein the resetting indicates that the  
24 corresponding data area is available for storing  
25 of a new attribute.

1 35. The method as described in claim 31 wherein the data  
2 space is formatted into a plurality of lines.